CERTIFICATE OF VERIFICATION

I, Soo Jin KIM of 648-23 Yeoksam-dong, Gangnam-gu, Seoul, Republic of Korea state that the attached document is a true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translation of the specification and claims of the Korean Patent Application No. 10-2003-0037618.

Dated this 5th day of October , 2007.

Signature of translator: _____

Soo Jin KIM

KOREAN INTELLECTUAL PROPERTY OFFICE

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Applicant(s): LG Electronics Inc.

COMMISIONER

[ABSTRACT OF DISCLOSURE]

[ABSRTACT]

The present invention relates to an optical disc write once and a method of managing defect information on the optical disc.

And more partially, The present invention related to a method of managing defect information on the optical disc includes preparing a temporary defect management area (TDMA) in which a temporary defect area list (TDFL) is recorded as defect management information for managing a defect area on the optical disc, recording the present temporary defect area list cumulatively with the previous temporary defect area list in the temporary defect management area, and recording position information for indicating a position of the latest temporary defect area list in the temporary defect management area along with the temporary defect area list to manage the temporary defect area list

[TYPICAL DRAWINGS]

FIG 4a

[INDEX WORD]

Write once, optical disc, BO-WO, TDDS, TDFL

[SPECIFICATION]

[TITLE OF THE INVENTION]

Method for managing defective information on optical write once

[BRIF OF THE INVENTION]

FIG. 1 schematically illustrates the structure of a related art rewritable optical disc;

FIG. 2 illustrates the structure of an optical disc write once according to the present invention;

FIG. 3 illustrates the structure of TDFL and TDDS applied to an optical disc write once according to the present invention;

FIG 4 illustrates a method of managing defect information on an optical disc write once according to the first embodiment of the present invention;

FIG 5 illustrates a method of managing defect information on an optical disc write once according to the second embodiment of the present invention;

FIG 6 illustrates a method of managing defect information on an optical disc write once according to the third embodiment of the present invention; and

FIG 7 illustrates a method of managing defect information on an optical disc write once according to the

fourth embodiment of the present invention.

[DETAIL DESCRIPTION OF THE INVENTION]

[OBJECT OF THE INVENTION]

[FIELD OF THE INVENTION AND BACKGOUND OF THE RELATED ART]

Optical discs on which a large capacity of data can be written as optical recording media have widely been used. Among them, a new HD-DVD (High-Density Digital Versatile Disc) on which video data and audio data can be written and stored in high qualities and in large quantities, for example, a BD (Blu-ray Disc), has been recently developed.

The blu-ray disc, which belongs to the next-generation HD-DVD technology, is the next-generation optical recording solution that can strikingly surpass the data recording capability of the existing DVDs, and the world standard specifications thereof have recently been established.

For the blu-ray disc, which is one of the world standards of HD-DVD, uses a celadon laser having a wavelength of 405nm that is much denser than a red laser of the existing DVD having a wavelength of 650nm, and thus a greater amount of data than the existing DVD can be stored on the disc which has a thickness of 1.2mm, a diameter of 12cm, and an optical transmission layer having

a thickness of 0.1mm.

As various kinds of standards related to the BD (Blu-ray Disc) have been prepared, various kinds of standards for BD-RE (BD Rewritable disc) and BD-WO (BD Write Once disc) have also been prepared.

FIG. 1 schematically illustrates the structure of a recording area of a BD-RE. The BD-RE of FIG. 1 shows the structure of the recording area of a disc having one recording layer. Seen from the inner periphery of the disc, the recording area is divided into a lead-in area, a data area, and a lead-out area.

Also, in the data area, an inner spare area ISA0 and an outer spare area OSA0 for replacement of a defect area are provided on the inner and outer peripheries of the data area, and a user area for recording therein user data is provided in the center of the data area.

If a defect area exists in a data area during recording of data on a BD-RE, the data recorded in the defect area is shifted to and replacement-recorded in a spare area. Also, position information related to a defect area, replacement-recorded area, etc., is recorded in defect management areas DMA 1, 2, 3 and 4 provided in the lead-in and lead-out areas as management information for the defect area to perform the defect management.

Also, in the case of the BD-RE, since the rewriting

is possible in any area of the disc, the whole area of the disc can randomly be used irrespective of its recording mode.

However, in the BD-WO (Blu-ray Disc Write Once), since only once recording of data in a specified area of the disc is possible, its recording mode is greatly restricted, and especially it is difficult to randomly use the whole area of the disc due to its management difficulty.

Also, in the high-density optical disc write once such as the BD-WO, the management of the defect area becomes an important term during the data recording.

Accordingly, although the optical disc write once requires a unified standard of management of the defect information in order to perform the defect management even on the optical disc write once, the presently published standard related to the optical disc write once cannot fulfill the requirement.

[TECHNICAL SOLUTION OF THE INVNETION]

Accordingly, the present invention is directed to an optical disc write once and a method of managing disc defect information on the optical disc that substantially

obviate one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a method of indicating a defect area and a method of managing the defect area.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention.

The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[DETAIL OF THE INVENTION]

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a method of managing defect information on an optical disc write once includes preparing a temporary defect management area (TDMA) in which a temporary defect area list (TDFL) is recorded as defect management information for managing a defect area on

the optical disc, recording the present temporary defect area list cumulatively with the previous temporary defect area list in the temporary defect management area, and recording position information for indicating a position of the latest temporary defect area list in the temporary defect management area along with the temporary defect area list to manage the temporary defect area list.

In another aspect of the present invention, a method of managing defect information on an optical disc write once includes preparing a temporary defect management area (TDMA) in which a temporary defect area list (TDFL) is recorded as defect management information for managing a defect area on the optical disc, recording the present temporary defect area list cumulatively with the previous temporary defect area list in the temporary defect management area in one recording unit, but recording the temporary defect area list as a separate defect area list by recording units, and recording position information for indicating a position of the latest temporary defect area list in the temporary defect management area as many as the number of recorded recording units along with the temporary defect area list to manage the temporary defect area list.

In still another aspect of the present invention, an optical disc write once includes a temporary defect

management area in which defect management information is recorded for management of a defect area, a first area for defect management, provided in the temporary defect management area, for cumulatively recording lists of the previous defect area to the present defect area as the defect management information, and a second area for defect management, provided in the temporary defect management area, for recording position information that indicates a position of the latest defect management information among the defect management information.

The first area for defect management is a temporary defect list (TDFL) area, and the second area for defect management is a temporary disc definition structure (TDDS).

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Reference will now be made in detail to the method of managing defect information on an optical disc write once according to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. For convenience' sake, explanation

will be made with respect to a BD-WO (Blu-ray Disc Write Once) as an example.

In addition, general terms widely used are selected in describing the present invention. In specified cases, however, terms selected at the applicant's discretion are also used, but their meanings are described in detail in the corresponding parts of the description.

Thus, it should be understood that the present invention should be grasp with the meanings of the terms, not the terms themselves.

FIG. 2 shows the structure of an optical disc write once and the method of recording disc management information according to the present invention.

The optical disc write once of FIG. 2 is a single-layer disc having one recording layer. This optical disc includes spare areas ISA0/OSA0 for replacement-recording data of a defect area, and a TDMA (Temporary Defect Management Area) for managing information of the defect area in order to manage a physical defect. In the case of a general rewritable optical disc, data can be repeatedly written in and erased from a DMA (Defect Management Area) even if the DMA has a limited size, and thus a DMA of a large size is not required.

However, in the case of an optical disc write once, a once-recorded area cannot be used for the data recording again, and a management area of a larger size is required. Also, in the case that no further recording is made on the optical disc write once, the final TDMA information is required to be transferred to and recorded in the DMA, and thus it is called the TDMA (Temporary DMA) in distinction from the DMA.

In FIG. 2, the TDMA is divided into a TDMA1 provided in a lead-in area with a fixed size and a TDMA2 having a size associated with a size of the spare area and provided in an outer spare area (OSA0) (for example, in FIG. 3, P= (N*256)/4), and the respective TDMA serves to prepare a TDFL (Temporary Defect List) and a TDDS (Temporary Disc Definition Structure).

Here, the TDFL means the information for managing as an entry list a series of processes for replacement of a defect area produced in the data area with the spare area, and the size of the TDFL is varied according to the size of the defect area. That is, in the case of a single layer, the TDFL is prepared with a size of 1~4 clusters, and in the case of a dual layer, it is prepared with a size of 1~8 clusters.

The TDDS is prepared in the unit of a cluster or both the TDDS and the TDFL are prepared in the unit of a cluster. The TDDS includes information for management of the optical disc write once and information on the defect management especially required in the present invention.

In the present invention, the defect management information means partial information of the TDFL and the TDDS.

Hereinafter, the detailed contents of the TDFL and the TDDS will be explained with reference to FIGs. 3Aand 3B.

FIG. 3A illustrates the structure of the TDFL applied to the present invention. The TDFL is briefly divided into three parts: a TDFL header, a defect entry list Defect_entry_List and a TDFL terminator.

The header is at the lead of the TDFL for recognition of the TDFL, and includes a 'TDFL update count' field which increases a count by 1 whenever the TDFL is prepared, a 'number of TDFL entries' field which means the number of defect entries that exist in the corresponding TDFL, and a 'number of first to N-th entry types' field which means the number of entry types.

The defect entry list Defect_entry_List actually includes the contents that constitute the TDFL, and is for

managing position information of the defect area and the replacement area for each defect area as one entry.

One entry is composed of 8bytes, and has the structure that an entry type, position information of the defect area *Defective cluster First PSN*, and position information of the replacement area *replacement cluster First PSN* are recorded in order.

The TDFL terminator is the information for informing the termination of the defect entry list Defect_entry_List.

In the case of a dual-layer disc, the defect entry list Defect_entry_List occupies 8 clusters at maximum, and in the case of a single-layer disc, the defect entry list Defect_entry_List occupies 4 clusters at maximum.

In FIG. 3B, the TDFL has the same structure as that of FIG. 3A, but the TDDS is recoded along with TDFL. That is, the TDDS may be recorded, being divided from the TDFL (as shown in FIG. 3A), and may be recorded in the same cluster along with the TDFL.

In the TDDS, diverse information may exist, and in the present invention, the TDDS should necessarily include position information of the latest TDFL *First PSN of latest TDFL*. In the optical disc write once, the position in which the latest TDFL is recorded is changed whenever the TDFL is newly prepared with respect to the defect area, and thus it

is necessary to manage the latest TDFL position information all the time. This may be specially called a TDFL pointer because it is the information that indicates the position information of the TDFL. The number of such latest TDFL position information may be changed according to the recording method of the TDFL, which will be explained later.

The term 'First PSN' used in the present invention means the physical sector number. In the case of BD-WO, the minimum recording unit is defined as one cluster, and since 32 sectors exist in one cluster, the 'First PSN' means the position information of the leading sector in the corresponding cluster. Consequently, the 'First PSN' means the position information of the corresponding cluster.

Hereinafter, the method of recording a TDFL and the method of recording a TDFL pointer according to the embodiments of the present invention will be explained.

For convenience' sake in explanation, the defect entry list Defect_entry-List is expressed as TDFL1, TDFL1c, TDFL21, TDFL32, etc. That is, TDFL1 means entries prepared at the first stage *stage1*, and TDFL1c means that the TDFL1 is cumulatively recorded.

Also, TDFL21 means first entries prepared at the second stage *stage2*, and TDFL32 means second entries prepared at the third stage *stage3*.

Also, for convenience' sake in explanation, the TDFL terminator is omitted, and the latest TDFL position information recorded in the TDDS is expressed such as P1,P2,P3,P4,P5....

Also, for convenience' sake in explanation, the cluster that is the recording unit is illustrated with a thick solid line.

FIGs. 4A and 4B illustrate a method of managing defect information on an optical disc write once according to the first embodiment of the present invention.

According to the method of managing defect information according to the first embodiment of the present invention as shown in FIG. 4A, the latest TDFL is repeatedly recorded cumulatively with the previous TDFL, and only one TDFL header and one TDFL pointer are used with respect to the TDFL of the cumulatively repeated 1~4 clusters (or 1~8 clusters). The TDFL header and the TDFL are recorded and managed in the unit of 1 cluster. In the case of an SL disc, the size of the TDFL is varied from 1 cluster to 4 clusters, and in the case of a DL disc, the size of the TDFL is varied up to 8 clusters.

At the first stage *stage1*, it is assumed that a TDFL header1 and a TDFL1 are recorded in 1 cluster. In the TDDS, information that indicates the position of the latest

defect management information is recorded, and in FIG. 4A, this is expressed as P1 that is the TDFL pointer as described above.

The position information indicated by this pointer is the first PSN, i.e., address, of the corresponding cluster.

In FIG. 4A, it is understood that the pointer indicates the position of the TDFL header1.

At the second stage *stage2* in FIG. 4A, TDFL21 and TDFL22 are further recorded during an update operation. The defect management information is recorded in a once-recordable state in the recording unit of 1 cluster on the disc, and in recording the defect management information at the second stage *stage2*, TDFL21 and TDFL22, which include TDFL1c that is identical to TDFL1, are cumulatively recorded along with the corresponding TDFL header2 and TDDS2. The second stage *stage2* refers to the recording method in the case that the list information of the defect management area exceeds 1 cluster, but is less than 2 clusters. That is, TDFL header2 + TDFL1c + TDFL21 = 1 cluster, the TDFL22 is recorded, occupying a partial area of the second successive cluster, and TDFL header2 contains the contents of the TDFL1c, TDFL21 and TDFL22 as a whole.

AT this time, the pointer value recorded in the TDDS2 shows that the latest defect information position P2 is recorded. That is, since the defect management information is cumulatively recorded, only one latest PSN is sufficient for the pointer.

At the third stage *stage3*, the defect management information after a sorting is performed is shown.

Here, the sorting means that the defect management information is sorted according to the PSN of the TDFL entry based on the TDFL entry type.

From a viewpoint of the second stage *stage2*, the sorting is performed under the assumption that a new TDFL entry to be included in a P2x position is produced.

If a new TDFL entry to be recorded is produced and is to be managed, the new TDFL should be recorded by reflecting the list information of the defect area sorted according to the sorting rule as described above. The third stage *stage3* shows this. That is, since all the information of TDFL1c, TDFL21 and TDFL22 are changed through sorting by the P2x, the changed defect management area list information is recorded as the TDFL31 and TDFL32, and the TDFL header3 corresponding to the TDFL31 and the TDFL32 is recorded in the lead of the corresponding information.

Also, in the TDDS3, the position information P3 of the latest defect management information is recorded. The TDFL31 occupies 1 cluster, and the TDFL32 occupies less than 1 cluster, following the TDFL31. Accordingly, at the third stage, the defect area management information exceeds 1 cluster, but is less than 2 clusters.

In summary, according to the method of managing defect information on an optical disc write once according to the third embodiment of the present invention, the TDFL is cumulatively recorded in the recording unit of 1 cluster whenever it is updated, and at this time, the TDDS expresses the position of the latest defect management information with one pointer only.

Also, in the case that the defect management information is changed according to the sorting rule, it can adaptively cope with such a change.

In FIG. 4A, the TDFL header has the information that indicates the number of clusters currently used. This means that a flag for representing how many clusters are used for representing the defect management area list can be employed since the size of the defect management information is variable.

It is also possible to record the information for representing the number of clusters currently used in not only the TDFL header but also the TDDS.

FIG. 4B shows a table that represents the change of the pointer of the TDFL by stages according to the first embodiment of the present invention.

In the first embodiment, it can be recognized that only one pointer is required.

FIGs. 5A and 5B illustrate a method of managing defect information on an optical disc write once according to the second embodiment of the present invention.

According to the method of managing defect information according to the second embodiment of the present invention as shown in FIG. 5A, the latest TDFL is repeatedly recorded cumulatively with the previous TDFL, and only one TDFL header and one TDFL pointer are used for each cluster with respect to the TDFL of the cumulatively repeated 1~4 clusters (or 1~8 clusters).

The TDFL recorded for each stage is the same as that in the first embodiment. In the second embodiment, one TDFL pointer is used for the corresponding cluster with respect to the TDFL the size of which is increased by stages.

Accordingly, even if the defect is produced during the recording of the cluster indicated by the P3 at the

second stage *stage2*, for example, it can be overcome through re-recording of only the corresponding cluster (i.e., cluster including the TDFL22), and if it is re-recorded, the defect can be overcome through the change of only the pointer indicated by the P3. Thus, the TDMA area consumed for the TDFL preparation can be reduced.

FIG. 5B shows a table that represents the change of the pointer of the TDFL by stages according to the second embodiment of the present invention.

In the second embodiment, 8 pointers are required at maximum, and pointers that were not used at the respective stages are set to zero.

FIGs. 6A and 6B illustrate a method of managing defect information on an optical disc write once according to the third embodiment of the present invention.

According to the method of managing defect information according to the third embodiment of the present invention as shown in FIG. 6A, the latest TDFL is repeatedly recorded cumulatively with the previous TDFL in one cluster, but the TDFL is separately recorded for each cluster, and position information of the latest TDFL is recorded in each recorded cluster in the TDDS.

At the first stage *stage1*, it is assumed that the TDFL header1 and the TDFL1 are recorded in 1 cluster. In

the TDDS, information that indicates the position of the latest TDFL is recorded, and in FIG. 6A, this is expressed as P1.

The position information indicated by this pointer is the first PSN, i.e., address, of the corresponding cluster in the optical disc structure.

In FIG. 6A, it is understood that the pointer indicates the position of the TDFL header1. In the case of an SL disc, the recording unit (e.g., 1 cluster) of the defect management information may be varied from 1 cluster to 4 clusters, and thus 4 pointers are required. In the case of a DL disc, the recording unit of the defect management information may be varied up to 8 clusters, and thus 8 pointers are required.

At the second stage *stage2* in FIG. 6A, TDFL21 and TDFL22 are further recorded during an update operation. The defect management information is recorded in a once-recordable state in the recording unit of 1 cluster on the optical disc write once, and in recording the defect management information at the second stage *stage2*, TDFL21 and TDFL22, which include TDFL1c that is identical to TDFL1, are recorded along with the corresponding TDFL header2 and TDFL header3 and TDDS2.

The second stage *stage2* refers to the recording method in the case that the list information of the defect management area exceeds 1 cluster, but is less than 2 clusters. That is, TDFL header2 + TDFL1c + TDFL21 = 1 cluster, the TDFL22 is recorded, occupying a partial area of the second successive cluster, and the corresponding TDFL header3 is recorded. At this time, the pointer value recorded in the TDDS2 shows that the latest defect information positions P2 and P3 are recorded.

At the third stage *stage3*, TDFL31 and TDFL32 are further recorded during the update operation. The defect management information is recorded in a once-recordable state in the recording unit of 1 cluster on the optical disc write once as described above, and in recording the defect management information at the third stage *stage3*, TDFL31 and TDFL32, which include TDFL22c that is identical to TDFL22, are recorded along with the corresponding TDFL header4 and TDFL header5 and TDDS3.

At this time, the TDFL header2, the corresponding TDFL1c and the TDFL21 are not newly recorded, but information that indicates the position P2 is recorded in the TDDS3, so that an unnecessary repeated recording is prevented, and the use efficiency of the recording area of the disc is heightened.

Also, if the TDFL22c, TDFL31 and TDFL32 information exceeds 1 cluster, but is less than 2 clusters, i.e., TDFL header4 + TDFL22c + TDFL31 = 1 cluster, the TDFL32 is recorded, occupying a partial area of the second successive cluster, along with the corresponding TDFL header5.

At this time, the pointer value recorded in the TDDS3 shows that the latest defect information positions P2, P4 and P5 are recorded.

The latest TDFL information can be obtained using P2, P4 and P5, which are positions of the latest defect management information recorded in the TDDS3. That is, the TDFL header2, TDFL1c and TDFL21 information can be obtained using the P2 position information indicated by the first TDFL pointer, and the TDFL header4, TDFL22c and TDFL31 information can be obtained using the P4 position information indicated by the second TDFL pointer. The TDFL header5 and TDFL32 information can be obtained using the P5 position information indicated by the third TDFL pointer.

At the fourth stage *stage4*, the defect management information after the sorting is performed is shown.

Here, the sorting means that the defect management information is sorted according to the PSN of the TDFL entry based on the TDFL entry type.

From a viewpoint of the third stage *stage3*, the sorting is performed under the assumption that a new TDFL entry to be included in the P2x position is produced.

Since all the information of TDFL1c, TDFL21, TDFL22c, TDFL31 and TDFL32 are changed through sorting by the P2x, the changed TDFL information is recorded as the TDFL41, TDFL42 and TDFL42, and the corresponding TDFL header6, TDFL header7 and TDFL header 8 are recorded along with a new TDDS4.

Here, in the TDDS4, P6, P7 and P8, which are position information of the latest defect management information of the latest defect management information, are recorded. The TDFL header 6 and the TDFL41 occupy 1 cluster, the TDFL header 7 and the TDFL42 occupy 1 cluster, and the TDFL header8 and the TDFL43 occupy less than 1cluster. Accordingly, at the fourth stage, the defect area management information exceeds 2 clusters, but is less than 3 clusters.

In summary, according to the method of managing defect information on an optical disc write once according to the third embodiment of the present invention, the TDFL header and the TDFL are recorded in the recording unit of 1 cluster whenever it is updated, and at this time, if the TDDS expresses the position of the latest defect management

information, and the recording is performed in excess of 1 cluster, the repeated recording is minimized using the information that represents the position of the latest defect management information, and the latest defect management information can be efficiently and promptly obtained.

Meanwhile, in FIG. 6A, obtaining of the defect management information may be divided into a case that the corresponding header has the corresponding information with respect to the TDFK contents, and a case that the latest TDFL header has the whole TDFL information.

For example, at the second stage *stage2*, the former corresponds to the case that the TDFL header2 has only the information on the contents of the TDFL1c and TDFL21, and the TDFL header3 has only the information on the contents of the TDFL22. The latter corresponds to the case that the TDFL header5 has the information on the whole contents of the TDFL1c, TDFL21, TDFL22c, TDFL31, and TDFL32.

In the former case, all the information related to the corresponding defect area can be obtained by processing all entry information of all headers in the position indicated by the information that represents the position of the latest defect management information, and in the latter case, all the information related to the whole

defect area can be obtained at a time only by the contents of the latest TDFL header.

Also, in FIG. 6A, the TDFL header has the information that indicates the number of clusters currently used. This means that a flag for representing how many clusters are used for representing the defect management area list can be employed since the size of the defect management information is variable. It is also possible to record the information for representing the number of clusters currently used in not only the TDFL header but also the TDDS.

FIG. 6B shows a table that represents the change of the pointer of the TDFL by stages according to the third embodiment of the present invention. In the third embodiment, 8 pointers are required at maximum, and the pointers that are not used at the respective stages are set to zero.

FIGs. 7A and 7B illustrate a method of managing defect information on an optical disc write once according to the fourth embodiment of the present invention.

According to the method of managing defect information according to the fourth embodiment of the present invention as shown in FIG. 7A, the latest TDFL is repeatedly recorded cumulatively with the previous TDFL in

one cluster, but the TDFL is separately recorded for each cluster, and position information of the latest TDFL is recorded in each recorded cluster in the TDDS.

In comparison to the third embodiment, the header that indicates the TDFL is not placed in the lead of the TDFL, but is placed in the TDDS.

This can prevent the complicated rule for recording the TDFL header information by recording the TDFL header in the TDDS. The TDDS is composed of 2048bytes, the TDFL header is composed of about 60bytes, and the existing TDDS information does not exceed 100bytes. Accordingly, there is no trouble in performing the recording in the TDDS.

FIG. 7B shows a table that represents the change of the pointer of the TDFL by stages according to the fourth embodiment of the present invention.

In the fourth embodiment, 8 pointers are required at maximum in the same manner as the third embodiment, and the pointers that are not used at the respective stages are set to zero.

It will be apparent to those skilled in the art than various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this

invention provided they come within the scope of the appended claims and their equivalents.

[EFFECT OF THE INVENTION]

According to the method of managing defect information on optical disc write once, the defect management information on optical disc write once can be easier than before and the defect management area can be used effecter than before.

What is claimed:

1. A method of managing defect information on an optical disc write once, comprising:

preparing a temporary defect management area (TDMA) in which a temporary defect area list (TDFL) is recorded as defect management information for managing a defect area on the optical disc;

recording the present temporary defect area list cumulatively with the previous temporary defect area list in the temporary defect management area; and

recording position information for indicating a position of the latest temporary defect area list in the temporary defect management area along with the temporary defect area list to manage the temporary defect area list.

2. The method of claim 1, wherein the temporary defect area list is recorded in the unit of 1 cluster, and its recording size is varied as large as a plurality of clusters.

3. The method of claim 2, wherein the position information that indicates the position of the latest temporary defect area list has only one piece of position information irrespective of the size of the temporary

defect area list.

4. The method of claim 2, wherein the position information that indicates the position of the latest temporary defect area list has one piece of position information for each cluster in which the temporary defect area list is recorded.

5. The method of claim 2, wherein the temporary defect area list is associated with the size of the defect area in the unit of 1 cluster, its recording size is varied as large as the plurality of clusters, and the temporary defect area list further includes information that indicates the number of clusters currently used.

6. The method of claim 2, wherein the temporary defect area list includes a header for recognizing the temporary defect area list, and the only one header is provided irrespective of the size of the temporary defect area list.

7. A method of managing defect information on an optical disc write once, comprising:

preparing a temporary defect management area (TDMA) in which a temporary defect area list (TDFL) is recorded as

defect management information for managing a defect area on the optical disc;

recording the present temporary defect area list cumulatively with the previous temporary defect area list in the temporary defect management area in one recording unit, but recording the temporary defect area list as a separate defect area list by recording units; and

recording position information for indicating a position of the latest temporary defect area list in the temporary defect management area as many as the number of recorded recording units along with the temporary defect area list to manage the temporary defect area list.

8. The method of claim 7, wherein the temporary defect area list is recorded in the unit of 1 cluster, and its recording size is varied as large as a plurality of clusters.

9. The method of claim 8, wherein the temporary defect area list includes a header for recognizing the temporary defect area list, and the only one header is provided for 1 cluster if the temporary defect area list has a plurality of clusters.

10. The method of claim 9, wherein the temporary

defect area list includes a header for recognizing the temporary defect area list, and the only one header is provided even if the temporary defect area list has a plurality of clusters.

11. The method of claim 10, wherein the header is recorded in a temporary disc definition structure (TDDS) area.

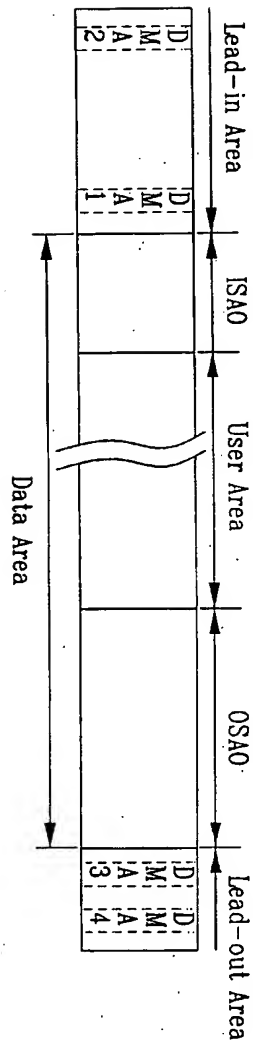
12. An optical disc write once comprising a temporary defect management area in which defect management information is recorded for management of a defect area, a first area for defect management, provided in the temporary defect management area, for recording the present defect area list cumulatively with the previous defect area list as the defect management information, and a second area for defect management, provided in the temporary defect management area, for recording position information that indicates a position of the latest defect management information among the defect management information.

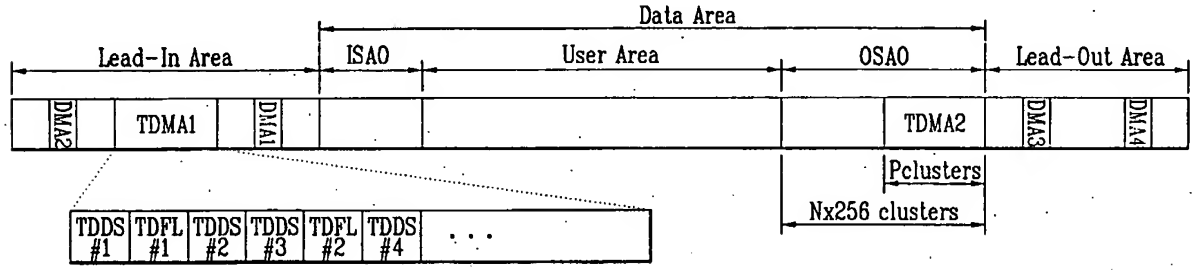
13. The optical disc of claim 12, wherein the first area for defect management is a temporary defect list (TDFL) area.

14. The optical disc of claim 12, wherein the second area for defect management is a temporary disc definition structure (TDDS) area.

15. The optical disc of claim 12, wherein the first area for defect management and the second area for defect management are recorded together in the same recording unit.

FIG. 1


Lead-in Area
ISAO
User Area
OSAO
Lead-out Area
Data Area
DMA1
DMA2
DMA3
DMA4



* DMA : Defect Management Area
* TDMA : Temporary DMA
* ISA : Inner Spare Area
* OSA : Outer Spare Area
* TDFL : Temporary Defect List
* TDDS : Temporary Disc Definition Structure

FIG. 2

FIG. 3a

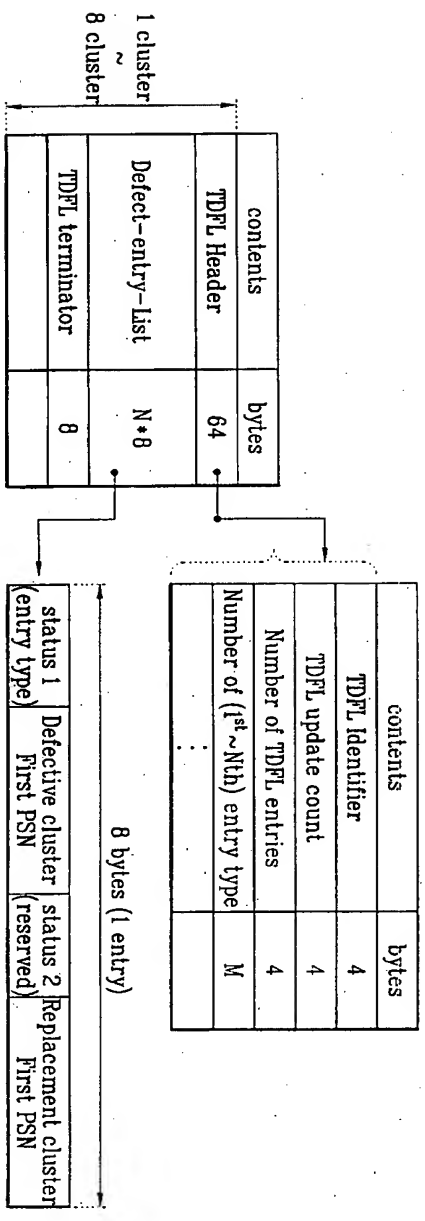

1 cluster
~
8 cluster
contents
bytes
TDFL Header
64
Defect-entry-List
N*8
TDFL terminator
8
contents
bytes
TDFL Identifier
4
TDFL update count
4
Number of TDFL entries
4
Number of (1st~Nth) entry type
M
8 bytes (1 entry)
status 1
(entry type)
Defective cluster
First PSN
status 2
(reserved)
Replacement cluster
First PSN

FIG. 3b

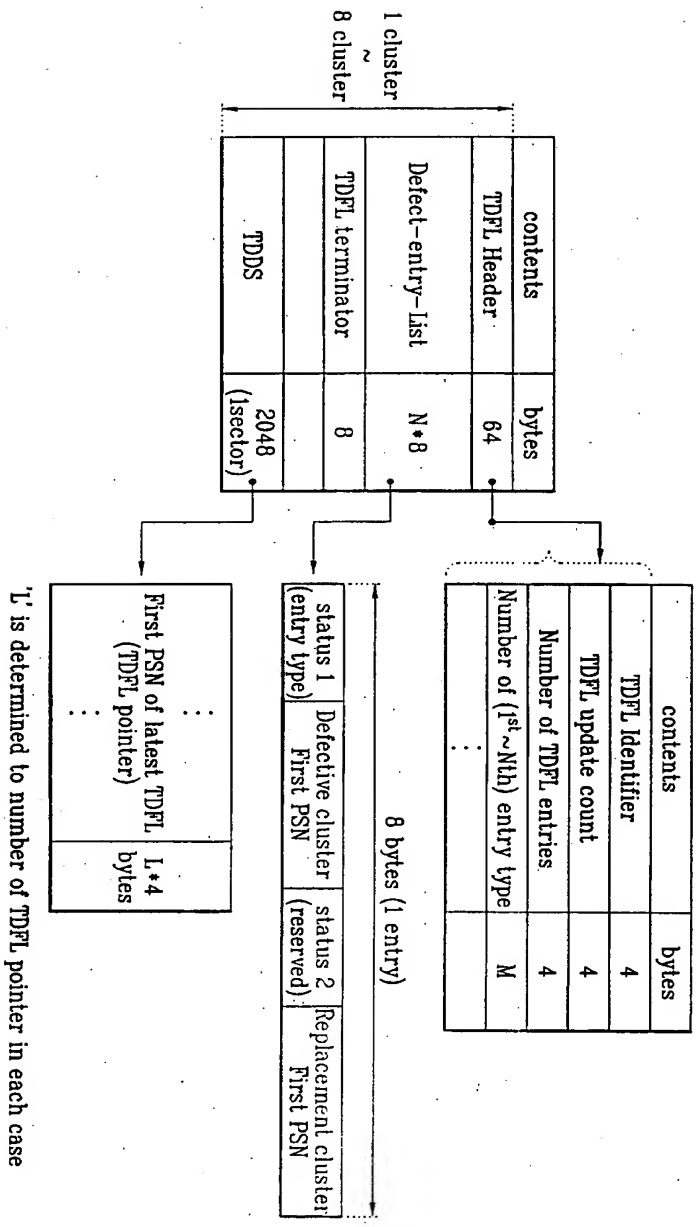

1 cluster
~
8 cluster
contents
bytes
TDFL Header
64
Defect-entry-List
N*8
TDFL terminator
8
TDDS
2048
(1sector)
contents
bytes
TDFL Identifier
4
TDFL update count
4
Number of TDFL entries
4
Number of (1st~Nth) entry type
M
8 bytes (1 entry)
status 1
(entry type)
Defective cluster
First PSN
status 2
(reserved)
Replacement cluster
First PSN
First PSN of latest TDFL
(TDFL pointer)
L*4
bytes
'L' is determined to number of TDFL pointer in each case

FIG. 4a

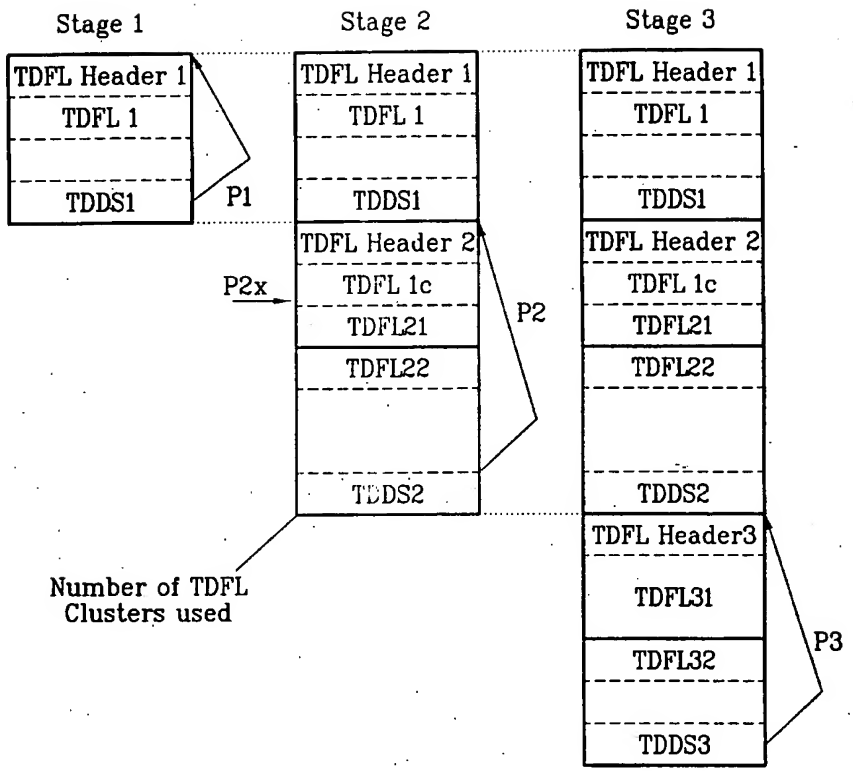


FIG. 4b

Disc	TDFL pointer	Stage 1	Stage 2	Stage 3	. . .
SL/DL disc	1st TDFL pointer	P1	P2	P3	. . .

FIG. 5a

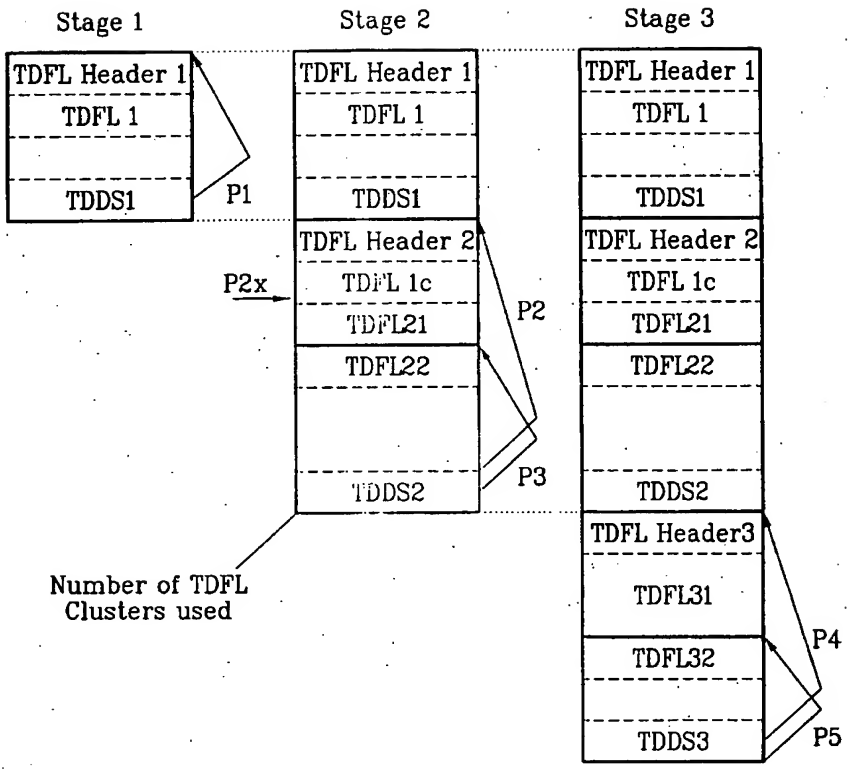

Stage 1
Stage 2
Stage 3
TDFL Header 1
TDFL 1
TDDS1
P1
TDFL Header 1
TDFL 1
TDDS1
TDFL Header 2
TDFL 1c
TDFL21
TDFL22
TDDS2
P2x
P2
P3
TDFL Header 1
TDFL 1
TDDS1
TDFL Header 2
TDFL 1c
TDFL21
TDFL22
TDDS2
TDFL Header3
TDFL31
TDFL32
TDDS3
P4
P5
Number of TDFL
Clusters used

FIG. 5b

Disc	TDFL pointer	Stage 1	Stage 2	Stage 3	· · ·
SL disc	1st TDFL pointer	P1	P2	P4	· · ·
	2nd TDFL pointer	0	P3	P5	· · ·
	3rd TDFL pointer	0	0	0	· · ·
	4th TDFL pointer	0	0	0	· · ·
DL disc	5th TDFL pointer	0	0	0	· · ·
	6th TDFL pointer	0	0	0	· · ·
	7th TDFL pointer	0	0	0	· · ·
	8th TDFL pointer	0	0	0	· · ·

FIG. 6a

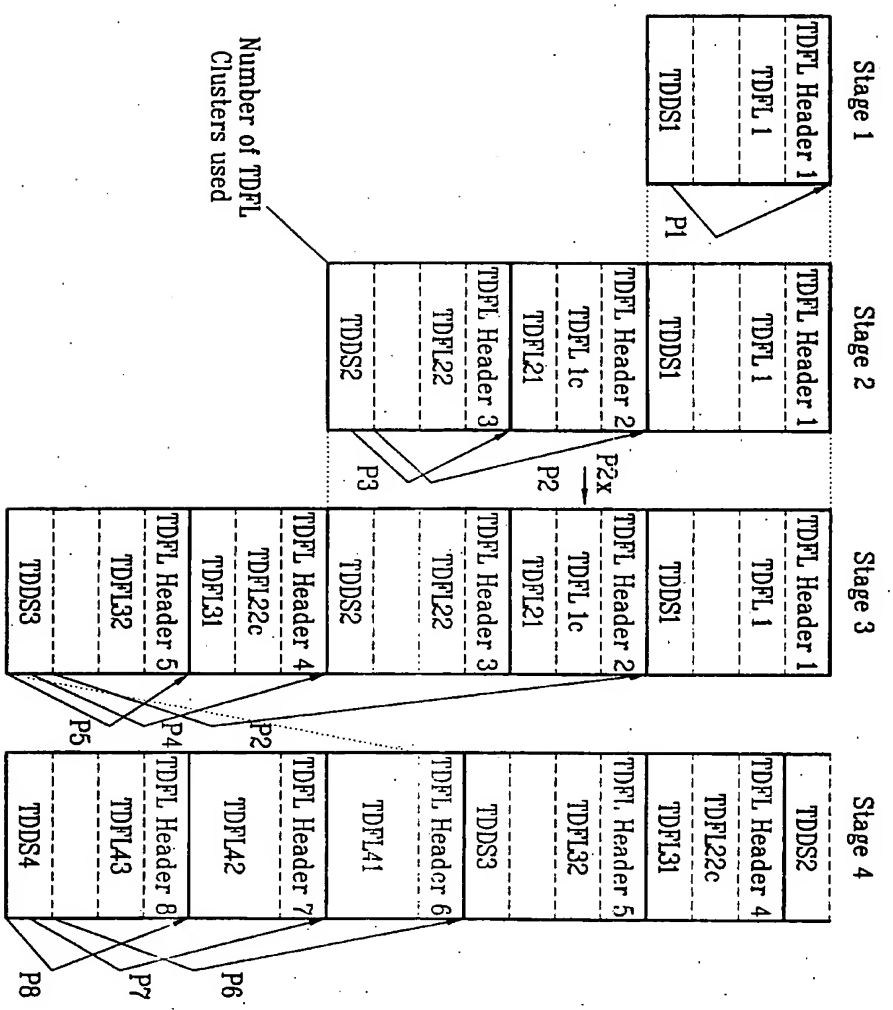

Stage 1
Stage 2
Stage 3
Stage 4
TDFL Header 1
TDFL 1
TDDS1
P1
TDFL Header 1
TDFL 1
TDDS1
TDFL Header 2
TDFL 1c
TDFL21
TDFL Header 3
TDFL22
TDDS2
P3
P2
P2x
Number of TDFL Clusters used
TDFL Header 1
TDFL 1
TDDS1
TDFL Header 2
TDFL 1c
TDFL21
TDFL Header 3
TDFL22
TDDS2
TDFL Header 4
TDFL22c
TDFL31
TDFL Header 5
TDFL32
TDDS3
P5
P4
P2
TDDS2
TDFL Header 4
TDFL22c
TDFL31
TDFL Header 5
TDFL32
TDDS3
TDFL Header 6
TDFL41
TDDS4
TDFL Header 7
TDFL42
TDFL Header 8
TDFL43
P8
P7
P6

FIG. 6b

Disc	TDFL pointer	Stage 1	Stage 2	Stage 3	Stage 4	· · ·
SL disc (DC disc)	1st TDFL pointer	P1	P2	P2	P6	· · ·
	2nd TDFL pointer	0	P3	P4	P7	· · ·
	3rd TDFL pointer	0	0	P5	P8	· · ·
	4th TDFL pointer	0	0	0	0	· · ·
DL disc	5th TDFL pointer	0	0	0	0	· · ·
	6th TDFL pointer	0	0	0	0	· · ·
	7th TDFL pointer	0	0	0	0	· · ·
	8th TDFL pointer	0	0	0	0	· · ·

FIG. 7a

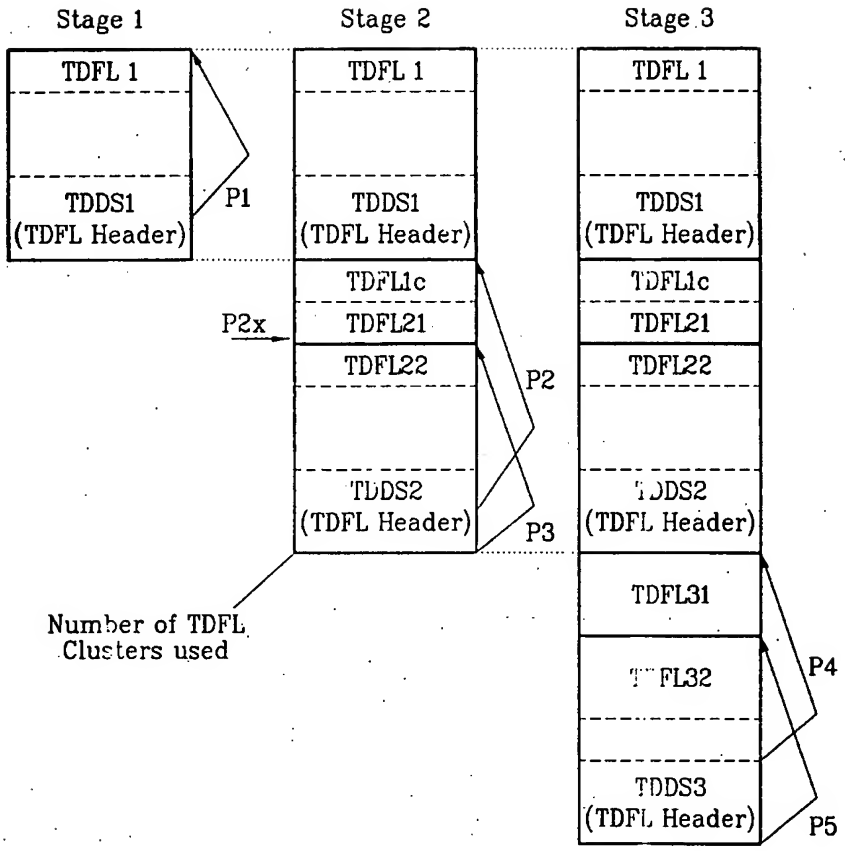

Stage 1
Stage 2
Stage 3
TDFL 1
TDDS1
(TDFL Header)
P1
TDFL 1
TDDS1
(TDFL Header)
TDFL1c
TDFL21
P2x
TDFL22
P2
TDDS2
(TDFL Header)
P3
Number of TDFL
Clusters used
TDFL 1
TDDS1
(TDFL Header)
TDFL1c
TDFL21
TDFL22
TDDS2
(TDFL Header)
TDFL31
TDFL32
P4
TDDS3
(TDFL Header)
P5

FIG. 7b

Disc	TDFL pointer	Stage 1	Stage 2	Stage 3	· · ·
SL disc	1st TDFL pointer	P1	P2	P4	· · ·
	2nd TDFL pointer	0	P3	P5	· · ·
	3rd TDFL pointer	0	0	0	· · ·
	4th TDFL pointer	0	0	0	· · ·
DL disc	5th TDFL pointer	0	0	0	· · ·
	6th TDFL pointer	0	0	0	· · ·
	7th TDFL pointer	0	0	0	· · ·
	8th TDFL pointer	0	0	0	· · ·

CERTIFICATE OF VERIFICATION

I, Soo Jin KIM of 648-23 Yeoksam-dong, Gangnam-gu, Seoul, Republic of Korea state that the attached document is a true and complete translation to the best of my knowledge of the Korean-English language and that the writings contained in the following pages are correct English translation of the specification and claims of the Korean Patent Application No. 10-2003-0020386.

Dated this 5th day of October , 2007.

Signature of translator: _____

Soo Jin KIM